

What is claimed is:

- 1 1. A safety binding assembly for securing a heel portion of a ski boot to a ski,
2 comprising:
3 a lower heel assembly attached to the ski, the lower assembly including a surface
4 having a first plurality of cams disposed on either side of a longitudinal and vertical plane
5 of the ski; and
6 an upper heel assembly coupled to the lower heel assembly, including
7 (i) a heel cup assembly for applying longitudinal securing pressure
8 to the ski boot;
9 (ii) a lateral release assembly for applying lateral securing pressure
10 to the ski boot, the lateral release assembly including a surface having a
11 second plurality of cams, corresponding to and facing the first plurality of
12 cams, disposed on either side of a longitudinal and vertical plane of the
13 ski;
14 (iii) a vector decoupling assembly for separating and isolating two
15 or more force vectors applied to the safety binding assembly; and,
16 (iv) a lateral heel biasing component for biasing the surface having
17 a second plurality of cams against the surface having a first plurality of
18 cams;
19 wherein the lateral release assembly is constructed and arranged to pivot in a
20 lateral and horizontal plane of the ski, against a force applied by the lateral heel biasing
21 component, about any one of a plurality of cam axes each defined by a contact point of
22 one of the first plurality of cams and one of the second plurality of cams, such that a
23 lateral force applied to the heel portion of the ski boot in a direction perpendicular to the
24 longitudinal and vertical plane of the ski causes the lateral release assembly to
25 progressively pivot about consecutive cams, producing an incrementally increasing force
26 opposing the lateral force applied to the heel portion of the ski boot, until the lateral
27 release assembly rotates beyond a predetermined cam axis and releases the ski boot.

1 2. A safety binding assembly according to claim 1, wherein the first plurality of
2 cams and the second plurality of cams are disposed symmetrically on either side of the
3 longitudinal and vertical plane of the ski.

1 3. A safety binding assembly according to claim 1, wherein the first plurality of
2 cams and the second plurality of cams are disposed asymmetrically on either side of the
3 longitudinal and vertical plane of the ski.

1 4. A safety binding assembly according to claim 1, wherein the lower assembly
2 includes a surface having four cams, two disposed on each side of the longitudinal and
3 vertical plane of the ski.

1 5. A safety binding assembly according to claim 1, wherein the lower assembly
2 includes a surface having six cams, three disposed on each side of the longitudinal and
3 vertical plane of the ski.

1 6. A safety binding assembly according to claim 1, wherein the lateral heel biasing
2 component includes

3 (i) a first tension shaft having a first end and a second end, and a second tension
4 shaft having a first end and a second end, pivotally attached to one another at the first end
5 of each tension shaft via a connector rod; and,

6 (ii) a spring coupled to the first tension shaft and the second tension shaft for
7 resisting longitudinal movement of the first tension shaft and second tension shaft;

8 wherein the second end of the first tension shaft is pivotally attached to the lateral
9 release assembly, and the second end of the second tension shaft is adjustably attached to
10 the lower heel assembly.

1 7. A safety binding assembly according to claim 1, wherein the lateral heel biasing
2 component includes

3 (i) a tension shaft having a first end and a second end, the first end of the tension
4 shaft being pivotally attached to the lateral release assembly, and the second end of the
5 tension shaft being adjustably attached to the lower heel assembly; and,

6 (ii) a spring coupled to the tension shaft for resisting longitudinal movement of
7 the first tension shaft and second tension shaft.

1 8. A safety binding assembly according to claim 1, wherein the vector decoupling
2 assembly includes a tongue component having a first end and a second end, the first end
3 being fixedly attached to the lateral release assembly and the second end being disposed
4 between a first surface fixedly attached to the lower heel assembly and a second surface
5 fixedly attached to the lower heel assembly, such that the tongue component, the first
6 surface and the second surface cooperate to allow motion of the lateral release assembly
7 to occur only in the longitudinal and horizontal plane of the ski.

1 9. A safety binding assembly according to claim 8, wherein the tongue component,
2 the first surface and the second surface cooperate to limit motion of the lateral release
3 assembly to within a predetermined region within the longitudinal and horizontal plane of
4 the ski.

1 10. A safety binding assembly according to claim 1, wherein the lateral release
2 assembly progressively pivots about consecutive cams so as to produce a consecutive
3 series of vector additions and subtractions with respect to the biasing of the lateral heel
4 biasing component.

1 11. A safety binding assembly according to claim 1, further including a contaminant
2 blocking material disposed between the surface having the first plurality of cams and the
3 surface having the second plurality of cams.

1 12. A safety binding assembly according to claim 1, further including a heel pad for
2 reducing friction between a bottom surface of the heel portion of the ski boot and the
3 safety binding assembly.

1 13. A safety binding assembly for securing a heel portion of a ski boot to a ski,
2 comprising:

3 a lower heel assembly attached to the ski, the lower assembly including a surface
4 having a first plurality of cams disposed on either side of a longitudinal and vertical plane
5 of the ski; and

6 an upper heel assembly including

7 (i) a heel cup assembly for applying longitudinal securing pressure
8 to the ski boot;

9 (ii) a lateral release assembly for applying lateral securing pressure
10 to the ski boot, the lateral release assembly including a surface having a
11 second plurality of cams, corresponding to and facing the first plurality of
12 cams, disposed on either side of a longitudinal and vertical plane of the
13 ski; and,

14 (iii) a lateral heel biasing component for biasing the surface having
15 a second plurality of cams against the surface having a first plurality of
16 cams;

17 wherein the lateral release assembly is constructed and arranged to pivot in a
18 lateral and horizontal plane of the ski, against a force applied by the lateral heel biasing
19 component, about any one of a plurality of cam axes each defined by a contact point of
20 one of the first plurality of cams and one of the second plurality of cams, such that a
21 lateral force applied to the heel portion of the ski boot in a direction perpendicular to the
22 longitudinal and vertical plane of the ski causes the lateral release assembly to
23 progressively pivot about consecutive cams, producing an incrementally increasing force
24 opposing the lateral force applied to the heel portion of the ski boot, until the lateral
25 release assembly rotates beyond a predetermined cam axis and releases the ski boot.

1 14. A safety binding assembly according to claim 13, wherein the first plurality of
2 cams and the second plurality of cams are disposed symmetrically on either side of the
3 longitudinal and vertical plane of the ski.

1 15. A safety binding assembly according to claim 13, wherein the first plurality of
2 cams and the second plurality of cams are disposed asymmetrically on either side of the
3 longitudinal and vertical plane of the ski.

1 16. A safety binding assembly according to claim 13, wherein the lower assembly
2 includes a surface having four cams, two disposed on each side of the longitudinal and
3 vertical plane of the ski.

1 17. A safety binding assembly according to claim 13, wherein the lateral heel biasing
2 component includes
3 (i) a first tension shaft having a first end and a second end, and a second tension
4 shaft having a first end and a second end, pivotally attached to one another at the first end
5 of each tension shaft via a connector rod; and,
6 (ii) a spring coupled to the first tension shaft and the second tension shaft for
7 resisting longitudinal movement of the first tension shaft and second tension shaft;
8 wherein the second end of the first tension shaft is pivotally attached to the lateral
9 release assembly, and the second end of the second tension shaft is adjustably attached to
10 the lower heel assembly.

1 18. A safety binding assembly according to claim 13, wherein the lateral release
2 assembly progressively pivots about consecutive cams so as to produce a consecutive
3 series of vector additions and subtractions with respect to the biasing of the lateral heel
4 biasing component

1 19. A vector decoupling assembly for separating and isolating two or more force
2 vectors applied to a safety binding securing a heel portion of a ski boot to a ski, wherein
3 the safety binding includes a lower heel assembly attached to the ski and an upper heel
4 assembly coupled to the lower heel assembly and having a lateral release assembly for
5 applying lateral securing pressure to the ski boot, comprising:
6 a tongue component having a first end and a second end, the first end being
7 fixedly attached to a lateral release assembly and the second end being disposed between
8 a first surface fixedly attached to the lower heel assembly and a second surface fixedly
9 attached to the lower heel assembly, such that the tongue component, the first surface and
10 the second surface cooperate to allow motion of the lateral release assembly to occur only
11 in the longitudinal and horizontal plane of the ski.

1 20. A safety binding assembly according to claim 19, wherein the tongue component,
2 the first surface and the second surface cooperate to limit motion of the lateral release
3 assembly to within a predetermined region within the longitudinal and horizontal plane of
4 the ski.